

Application No. 10/512,104
Amendment date April 24, 2006
Reply to Office action of January 24, 2006

REMARKS/ARGUMENTS

Reconsideration and re-examination of this application are requested.

Summary of Amendments

Claims 1, 2, 7-10, 24 and 25 are amended, and claims 31 and 32 are added.

The amendments to claim 1 are intended to make it more clear that the claimed cartridge (an insulative body which carries a plurality of electrical contact members) is insertable into a housing of a cable-end connector moiety so that, upon such insertion, the cartridge contacts make engagement within the housing with corresponding contacts connected to corresponding wires of the cable. As inserted into the housing of the first connector moiety, the cartridge completes the structure of that connector moiety and makes it possible for that moiety, via the cartridge contacts, to be coupled to a cooperating second connector moiety. The cartridge includes a common contact member and a plurality of noncommon contact members. Each of the cartridge contact members has a female contact end, which end is undersized relative to the diameter of the cartridge body hole in which the female contact end is disposed so that the female contact end can move laterally within the body.

Newly added independent claims 31 and 32 are patterned after claim 1. Each of them is focused upon a multi-contact cartridge which is insertable into a housing of a first connector moiety so that the cartridge contact members engage respective internal contacts within that first moiety and so complete the structure of that first moiety. Like claim 1, each of claims 31 and 32 states that each cartridge contact member has a female contact end which is afforded lateral movement within the cartridge body hole in which the cartridge contact member is carried. The first connector moieties of claims 31 and 32 are pertinent to a multi-function electrical connection between a tow vehicle and a towing vehicle. Claim 32 states that the multi-contact cartridge is insertable into a housing for a cable-end plug.

Claims 2 and 7-10 have been amended to become independent claims by incorporation of the substance of former claim 1 into each of them. In making claims 2 and 7-10 independent, the

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wording of those former claims has been adjusted, without changing substance, to improve readability of the resulting independent claims.

Claims 24 and 25 (allowed by the action of January 24, 2006) have been amended to correct for a lack of antecedent basis in former claim 24 and to appropriately reflect that amendment in claim 25 which is dependent on claim 24. No change has been made to the substance of either of claims 24 and 25.

Review of the Invention as Illustrated

Applicant perceives that the Office has greatly misperceived the invention as claimed, also the applied references, and certain terms used in the rejected claims which continue to appear in the amended claims. Applicant believes that a brief review of the invention as disclosed and claimed will assist the Office to more correctly interpret the claims and the applied references and to appreciate the significance and meaning of certain claim terms (notably, the term "cartridge").

As noted in the present specification (see esp. "Technical Field of the Invention" and "Background of the Invention" at pages 1-3), the preferred real-world practical manifestation of this invention is found in the structure of a plug at the end of a cable used to establish electrical connections in circuits between truck tractors and truck trailers. Such a plug is one component (first moiety) of a two-component electrical connector, the other component (second moiety) of the connector being a socket with which the plug is releasably matable. A plug 10 of this invention is shown generally in FIG. 1 and in greater detail in the remaining figures of the application drawings. A socket with which plug 10 can mate is not shown. The plug and the related socket preferably conform to standard SAE J560; see "Incorporated Reference Documents" at page 1 of the specification and the document identified at 8 in Form PTO/SB/08A/B in the IDS filed October 21, 2004.

The principal parts of plug 10 are a housing 12 and the two mating assemblies of a multi-contact electrical connector 18, namely, a contact cartridge 20 and body 23 which is connected to an end of a multi-conductor electrical cable 11. Connector 18 and its components are part of the

structure of plug 10. Plug 10, in turn, is one component of a more primary connector; the other component of that more primary connector is a socket which is not depicted in applicant's drawing.

In the assembled ready-to-use state of plug 10, cartridge 20 and body 23 lie essentially wholly within plug housing 10; only the large diameter end (left end in FIGs. 1 and 2) of the cartridge is outside the plug housing in the form of the invention shown in FIGs. 1 and 2. Cartridge 20 carries the contact members (seven female contacts 30 and 31, see FIG. 2) which are matable with (male) socket contact elements in use of plug 10. In the form of the invention shown in FIG. 2, the female aspects of contact members 30, 31 are at the left ends of those members. The opposite (right) ends of contact members 30, 31 define contact features (male, as shown) which are matable with cooperating contact structures 22 (see FIG. 13) which preferably are molded into body 23 where they have mechanical and electrical connection to ends of the respective conductors of cable 11. Contact structures 22 are cable conductor termination contacts (terminals).

The female contact features of contact members 30, 31 are the real working contacts of plug 10 as they are the parts of plug 10 which are releasably matable with the contacts of socket with which the plug is engaged during use of the plug. The left-end female contact features of contact members 30, 31 can become damaged, corroded or worn over time in the course of use of plug 10, and so can require repair or replacement. As described in applicant's Background of the Invention and Summary of the Invention, replacement of such worn working contacts is made into a simple process by making contact members 30, 31 easily removable as a set from the plug housing. To that end, contact members 30, 31 are mounted in a nonconductive unitary carrier 28 (see FIG. 2) which itself is releasably secured within plug housing 12. Carrier 28, and contact members 30, 31 within it, comprise a removable contact cartridge 20. The cartridge is a readily replaceable component of plug 10.

As made clear in the present specification (page 9, lines 13, et. seq.), cartridge 20 is a first component (moiety) of electrical connector 18 which is internal to (i.e., has its interface within) plug housing 12, and which co-acts with a second component (moiety) of connector 18 as

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defined by body 23 and by contact elements 22 which have permanent connection within the body to the wires of cable 11. Connector 18 is undisturbed as plug 10 is repeatedly engaged with and disengaged from sockets during use of the plug. The components of internal connector 18 are separated from each other only when it becomes useful to replace contact members 30, 31 due to their becoming damaged, corroded or worn.

It is correct and appropriate to refer to assembly 20 as a "cartridge", as that term is entirely consistent with the meanings of that term as established by the several dictionary definitions of "cartridge" which were attached to applicant's Amendment of November 3, 2005, herein.

The Office is requested to particularly note FIGs. 13, 15, 16 and 17 of the present drawings. Attention is directed to terminal elements 22 (shown as such in FIG. 15) which have first arms 22A and second arms 22B. Those arms are crimped around the circulation and bare conductor, respectively, of a wire of multi-wire cable 11 to be permanently connected to the wire within body 23. That content of applicant's disclosure is meaningful to a correct understanding of Shaffer et al. '875, as shown below in these Remarks.

Claims 1, 31 and 32 describe a multi-contact cartridge structure, and so pertain, *inter alia*, to cartridge 20.

Review of the Final Rejection of Claim 1

The final rejection of claim 1 under § 103(a) is grounded on the combination of Shaffer et al. '875 and Stoner'558. The stated rejection asserts that the subject matter of claim 1 (as presented on November 3, 2005) is disclosed by Shaffer et al. except for the content of claim 1 describing the lateral movement of the female contact end of each cartridge contact within the hole (in the cartridge body) in which the female contact end is disposed. The stated rejection relies upon Stoner for disclosure asserted to suggest making the contact members of Shaffer et al. laterally movable within their supporting structure.

In the course of stating the rationale for the rejection summarized above, the Office appears to have greatly misperceived the language of claim 1 and to have meaningfully

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misinterpreted the disclosures of the applied references. Also, the Office appears not to have understood (or not to have accepted) applicant's prior remarks and supporting evidence (see Amendment of November 3, 2005) concerning the meaning and practical significance of the term "cartridge" as used in claim 1 (and also in newly added claims 31 and 32). The Action of January 24, 2006, makes no reference to or acknowledgment of applicant's prior remarks and evidence pertinent to that claim term, i.e., "cartridge".

Reasons for Allowance of Claim 1

The Office's misinterpretation of the disclosures of Shaffer et al. '875 is shown by the Office's assertion in the final rejection that "*Shaffer et al. (Figs. 1-5) discloses a multi-contact cartridge (14) removably insertable into an open-ended housing (16) of a connector moiety (12)*". Shaffer et al. disclose no such thing.¹

Shaffer et al. do not disclose or suggest a contact cartridge as described and claimed by applicant. That is, Shaffer et al. do not disclose or suggest a modular component of a first connector moiety in which a plurality of contact members are carried in an insulative body, and in which the body and the contact members are so arranged that insertion of that carrier body into a housing of that first connector moiety causes the carrier contacts to engage other contacts within that same housing, those carrier contact members also providing the elements by which that first connector moiety makes functional engagement with a separate second connector moiety. Shaffer et al.'s structure 14 is the entirety of a connector plug (referred to as a plug member 14 by Shaffer et al.) which cooperates with a separate connector receptacle (socket) 12. In the context of applicant's claim 1, Shaffer et al.'s plug 14 corresponds to the claim's first connector moiety, and receptacle 12 corresponds to the claim's second connector moiety. Shaffer et al.'s plug 14 includes female contacts 64 (primary contacts) and 58 (secondary contacts). Each of contacts 58 and 64 is connected directly (and permanently) to a respective conductor of a multi-conductor cable 74 for which plug 14 is a termination. The direct

¹ A summary of the disclosure of Shaffer et al. is an attachment to this Amendment.

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connection of a contact 64 to a cable conductor wire in Shaffer et al. is shown in the emphasized content of the attached copy of Shaffer et al.'s FIG. 4². There is no hint or suggestion in Shaffer et al. that contacts 58 are differently associated with conductors in cable 74. Thus, the path from a conductor of cable 74 to a corresponding contact (22, 28) of the separate receptacle 12 is from the cable conductor to a plug contact (58, 64) to a socket contact (22, 28). That is, in the fully assembled plug 14 of Shaffer et al., there is only one contact (58, 64) associated with each cable conductor. Stated differently, in Shaffer et al., a contact (58, 64) is both a cable conductor termination contact and the contact via which the plug engages the receptacle (socket).

The facts that Shaffer et al.'s plug 14 has only a single contact per cable conductor, and that contact is permanently connected to the cable conductor is established by the essential identity between a) the content of Shaffer et al.'s FIG. 4 which is emphasized in the attachment hereto, and b) the content of applicant's FIGs. 13, 15, 16 and 17.

Shaffer et al.'s FIG. 4 depicts plug 14 engaged with receptacle (socket) 12. Contacts 22 and 24 are components of the socket, not of plug 14, as made clear by Shaffer et al.'s FIGs. 1 and 3. The Office's assertion that this reference discloses "*each conductor (FIG. 4) of the cable having a termination contact (22, 24)*" is incorrect; cable 72 is associated with plug 14, whereas contacts 22, 24 are components of the separate socket 12. Applicant perceives that the presence of this incorrect assertion about the disclosures of Shaffer et al. reveals that, in formulating and stating the final rejection of claim 1, the Office did not correctly understand the content of Shaffer et al. and may have misunderstood applicant's claim 1. In any event, it is apparent that Shaffer et al. does not disclose or suggest the subject matter asserted by the Office. Shaffer et al., even in combination with Stoner, does not provide an adequate basis for rejection of claim 1 under §103(a).

Claim 1, especially as currently amended, makes it clear that the fully assembled first connector moiety (e.g., plug 10 as shown in applicant's FIG. 1), namely, the first connector moiety's housing with the multi-contact cartridge inserted therein, has two contact elements in

² Applicant would have preferred to have submitted a colorized version of FIG. 4 to make this point clear. However, it is understood that all documents received by the Office are electronically scanned to create an Image File Wrapper which is in black and white so that colorization would be lost.

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the path from a cable conductor to the desired contact of a separate second connector moiety (e.g., socket, not shown in applicant's drawings). Those two contact elements (separate pieces of structure) are 1) a termination contact (such as contact 22 shown in applicant's FIG. 13) connected to a cable conductor and located within the housing, and 2) a cartridge contact member 31, e.g., carried in the body of cartridge 20, such as is shown in applicant's FIG. 13.

Claim 1, as currently presented, more clearly defines subject matter which would not have been suggested by Shaffer et al. and Stoner to a person skilled in the art pertinent to electrical connectors used to connect towing and towed vehicles such as heavy duty truck tractors and trailers. The introduction to claim 1 states that the claimed contact cartridge (multi-contact cartridge) is a component of a first connector moiety which is connected (secured) to a multi-conductor cable, the cable being used between a tow vehicle and a towed vehicle. The introduction to claim 1 states that the cartridge is removably insertable into an open-ended housing of that first connector moiety. The introduction to claim 1 states that, within the housing of that first connector moiety, there are termination contacts connected to the (respective) conductors (wires) of the cable. In that context, and with reference to it, claim 1 describes the multi-contact cartridge as being comprised by a nonconductive body having holes (passages) through it, a common contact member, and plural noncommon contact members. Claim 1 now identifies those contact members as "cartridge" contact members which are carried by the cartridge body, thus to make it more clear that those contact members are readily removable from the housing with the cartridge body. Claim 1 further states that, when the cartridge is secured within the housing of that first connector moiety, one end of each cartridge contact member is in conductive engagement, within the housing, with a respective one of the cable conductor termination contacts. In that way, claim 1 defines structure which would not have been obvious under §103(a) in view of Shaffer et al. and Stoner. That is, that combination of descriptions in claim 1 defines a structural combination which Shaffer et al. does not disclose and would not have suggested. Shaffer et al. is factually and legally deficient as to claim 1 for these reasons. The combination of Stoner with Shaffer et al. does not cure that deficiency of

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Shaffer et al., nor would Stoner have suggested a cure for that deficiency. Claim 1 is allowable over the applied references for the reasons set forth above.

Further, claim 1 states, in effect, that each of the cartridge contact members has a female contact end (i.e., an end which is structured to define a female contact), and those female contact ends are undersized relative to the cartridge body holes in which they are disposed. The result is that the female contact ends of the cartridge contact members can move laterally within the cartridge body. The Office has combined Stoner with Shaffer et al. in respect to those aspects of claim 1. Stoner contains no hint or suggestion that either of his terminals 10 or 76 be readily separable from the conductors (30) to which they are shown to be connected, or that plural numbers of them be carried in a cartridge which is removable from housings 42 or 72. Stoner, when combined with Shaffer et al., does nothing to cure the material deficiency of Shaffer et al. as to claim 1. Claim 1 is allowable over the combination of Shaffer et al. and Stoner.

Allowability of Claims 31 and 32

Claim 31 differs from claim 1 in ways which do NOT cause Claim 3 to be patentably different from claim 1 in light of the combination of Shaffer et al. '875 and Stoner '558. Claim 1 refers to internal contacts within the housing of the first connector moiety, whereas claim 1 describes a termination contact connected within the housing to a conductor in a cable with which the first connector moiety is associated. Claim 31 does not refer to a cable, whereas claim 1 does. Claim 31 otherwise has substance corresponding to that of claim 1, and that substance defines patentably over the combination of Shaffer et al. and Stoner for the reasons set forth above concerning claim 1.

Claim 32 describes the multi-contact cartridge as a (replaceable) component of a plug located at one end of a multi-conductor cable in a multi-function connection between a tow vehicle and a towed vehicle. Claim 32, like claim 1, states that there is a termination contact connected within the plug housing to each conductor of the cable. Claim 32 does not mention a second connector moiety or a socket. Claim 32 otherwise has substance corresponding to that of claim 1; that substance defines patentably over the combination of Shaffer et al. and Stoner for the reasons set forth above concerning claim 1.

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Both of claims 31 and 32 state that the female contact end of each cartridge contact member is undersized relative to the cartridge body hole in which the cartridge contact member is disposed.

Claims 2, 7-10, 24 and 25

Claims 2 and 7-10 as amended are independent claims; they formerly were dependent claims, all dependent on claim 1. Claims 2 and 8-10 were objected to as being dependent on claim 1 (version of November 3, 2005). Claims 2 and 8-10 have been made independent by incorporating into them the substance of claim 1, version of November 3 2005; they are allowable.

Claim 7 has similarly been converted from dependent to independent form by incorporation into former claim 7 of the substance of claim 1 as here amended. Claim 7 is allowable for the reasons advanced for allowance of claim 1.

The amendment to claim 24 corrects a lack of antecedent basis for "a second" in that claim as earlier presented; "second" presumes a "first" which was not named in either of claims 22 or 23. The amendment to claim 25 is consistent with the amendment to claim 24.

For the reasons set forth, claims 1, 2, 7-10, 24, 25, 31 and 32 are allowable over Shaffer et al. '875 in combination with Stoner '558. Advice of such allowability by the Office to applicant is solicited.

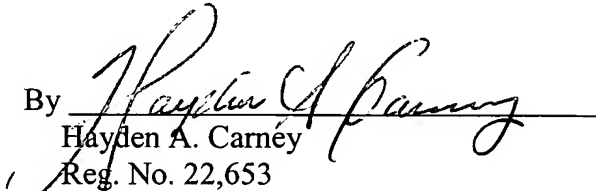
Request for Interview

Applicant requests an interview in this application IF, on review of the Amendment, the Office continues to be of the view that some claims of this application are not allowable over the art of record. The requested interview may be telephonic or may be conducted in the Office by conference between applicant's representative and the cognizant Examiners. Whether the interview will be telephonic or in person can be decided by a brief preliminary telephone discussion.

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The Office will please note that applicant's undersigned representation will be unavailable in the period from May 4 to May 18, 2006.

Respectfully submitted,
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By 
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HAC/jmp

Attachment:

1. Annotated copy of Fig. 4 of Shaffer et al. '875
2. Summary of Disclosures of Shaffer et al. '875

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SUMMARY OF DISCLOSURES OF SHAFFER ET AL. '875
(ATTACHMENT TO AMENDMENT OF APRIL 24, 2006
IN APPLICATION NO. 10/512,104)

Introduction

The objective of Shaffer et al. is to provide plug and socket arrangements, useful to make connections of multiple circuits between heavy duty tractors and trailers, which effectively comply with Standard SAE J560 (governing the matability of such plugs and sockets) while also providing additional circuit connections in a way which does not interfere with J560 requirements. Standard J560 pertains to plugs and sockets which provide 7 conductive paths between them; one of those paths is a common path to a tractor battery, and the other 6 paths are the "hot" paths for six separate function circuits defined in SAE J560. In the context of Shaffer et al. '875, the electrical contacts which make connections in those 7 paths may be called "primary" contacts.

Shaffer et al. addresses the need in modern heavy duty truck tractors for more than six electrical circuits in a trailer to be powered from a tractor coupled to the trailer. Shaffer et al. add to J560 plugs and sockets additional mating terminals (contacts) which may be called "secondary" or J560++ contacts, and does so in a way which permits a J560++ socket on a trailer to cooperate with either a J560 plug or a J560++ plug.

Schaffer et al. achieve the objective by making the primary J560 male contacts 22 of the socket 12 longer than the secondary J560++ contacts 24 (see Shaffer et al.'s Fig. 1, e.g.). A J560++ plug carries both primary female contacts 64 according to Standard SAE J560 and additional (smaller) secondary female J560++ contacts 58. Such a plug has recesses 62 along the plug body which open to the body end face to which the female contacts 58, 64 open. Those recesses 62 accommodate stop shoulders 28 defined in the inner walls of the socket sleeve in which male contacts 22, 24 are located. A J560++ plug can be fully (deeply) engaged in the socket sleeve (see Fig. 4) because the plug end face can advance into the socket beyond the plane of the ends of socket stop shoulders 28 as those shoulders move into the plug's circumferential recesses 62.

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A J560 7-contact plug , however, has no circumferential recesses 62. As a J560 plug is inserted into a J560++ socket, the socket stop shoulders 28 abut the plug end face and limit the depth to which the plug can be inserted into the socket to a shallow insertion depth. That shallow insertion depth enables the longer primary male contacts 22 of the socket to mate with the plug's primary female contacts 64. However, a J560 plug cannot be advanced into the J560++ socket far enough for the shorter J560++ secondary male contacts to physically engage the end face of the J560 plug.

All of Shaffer et al.'s female contacts 58, 64 are permanently connected in the body of plug 14 to respective conductors of a multi-conductor cable 72 (Fig. 4) which terminates at plug 14. Similarly, all of socket contacts 22, 24 are permanently connected in the socket to respective wires from the socket. The phantom line depictions in Shaffer et al.'s Fig. 4 shows that the preferred permanent connection of contacts 22, 24, 58, 64 to the respective conductors and wires is by crimping arms at the inner (non-female or non-male) ends of those contacts around the respective conductors/wires to securely mechanically lock the contacts onto the conductors/wires. None of contacts 22, 24, 58, 64 is conveniently removable from its respective carrying body.